Space Weather Forecast

Issued on Saturday, 13 May 2023 at 01:15 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Slight chance of further Minor geomagnetic storms (G1) over UTC weekend. Chance of Minor/Moderate radio blackouts decreasing slightly into new week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity reverted to low in the past 24 hours, with X-rays showing occasional common-class activity and peaking with a long-period event at 12/1336UTC and a similar-sized flare at 12/2359 from the most complex sunspot region on the northwestern solar horizon. This event was associated with a Coronal Mass Ejection (CME) that does not carry an Earth-directed component. The sunspot group responsible was one of up to nine on the Sun for a time, although one of these faded away in the southeast over the period. The sunspot responsible for the largest flare of the 24 hours is now becoming difficult to discern, however apparent overall areal decay was contrasted with some trailing spot development. Most of the other sunspot regions were quiet or in slow decay, however there was some proliferation of spots in two groups in the northeast.

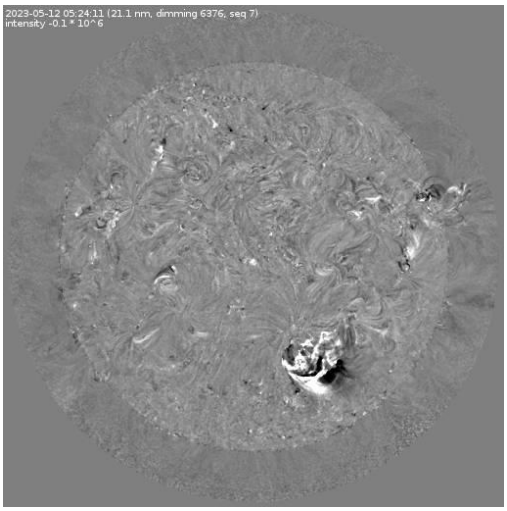

Figure 1: Time-integrated extreme UV image of 12/0500UTC 'filament eruption' that s currently undergoing assessment. Image processing courtesy of SIDC ROB.

A 'filament eruption' (arc of plasma) was seen in the southwest on ground-based near-infrared telescope imagery around 12/0500UTC. A narrow CME was seen heading largely south and west of the Sun-Earth line - this has been analysed and modelling results are awaited. There were other CMEs observed in imagery, including from behind the northeastern solar horizon, which may herald the arrival of a new sunspot region, while a partial halo heading south and west later in the UTC afternoon was determined to be far-sided - to no effect at Earth.

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Solar Wind / Geomagnetic Activity: The solar wind was suggestive of a CME arrival - presumed to be that from 09 May. A sharp discontinuity was seen at 12/0549UTC in satellites in Earth orbit in most solar wind measures, with the speed rising sharply to elevated levels, in a reversal of a previous gradual decline into slightly elevated, with an erratic decline then re-establishing for the remainder of the period. The number of particles comprising the solar wind was mostly slightly elevated, with a rise after the CME onset, before a decline into the UTC evening. The magnetic field associated with the solar wind was similarly slightly elevated after the CME onset, however the north-south component showed a fairly strong co-aligned bias (with Earth's field) to somewhat limit geomagnetic effects.

The net result of the above solar wind measures was for quiet to Minor Geomagnetic Storm G1 intervals, with the provisional peak Kp of '5o' in the 12-15UTC interval coinciding with an anti-aligned Bz component while the solar wind speed and density were still enhanced.

Energetic Particles / Solar Radiation: Solar radiation levels very soon settled to their typical background level in the period, with no storms in evidence.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity carries a chance of returning to moderate, with this risk greatest over the current UTC weekend while the most complex sunspot remains on the facing side, else tentatively falling a little into the new working week, with no major returning regions expected.

Solar Wind / Geomagnetic Activity: The 09 May full halo CME arrived at Earth around 12/0634UTC and has now largely passed, with the solar wind speed now in decline. A further CME was observed following the moderate-class X-ray flare that occurred on 11 May in the southwest of the Sun. It may glance the Earth on 14 into 15 May, but with very low confidence. Thirdly and finally, any Earth-directed component from the 12/0500UTC 'filament eruption' is not yet known, with modelling results pending.

With little on the Sun that could cause any fast wind, the above CMEs should deliver a decreasing slight chance of G1 over the first three days of the period, with an increasingly quiet forecast otherwise expected.

Energetic Particles / Solar Radiation: Solar radiation storms are rated at a daily Slight Chance of S1, decreasing slightly into the new working week as the main sunspot responsible for this risk crosses the western solar horizon and rotates away.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	20	10	10	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	40	40	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	15	15
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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